

e-Hydro Applications in Precision Navigation and Cartography

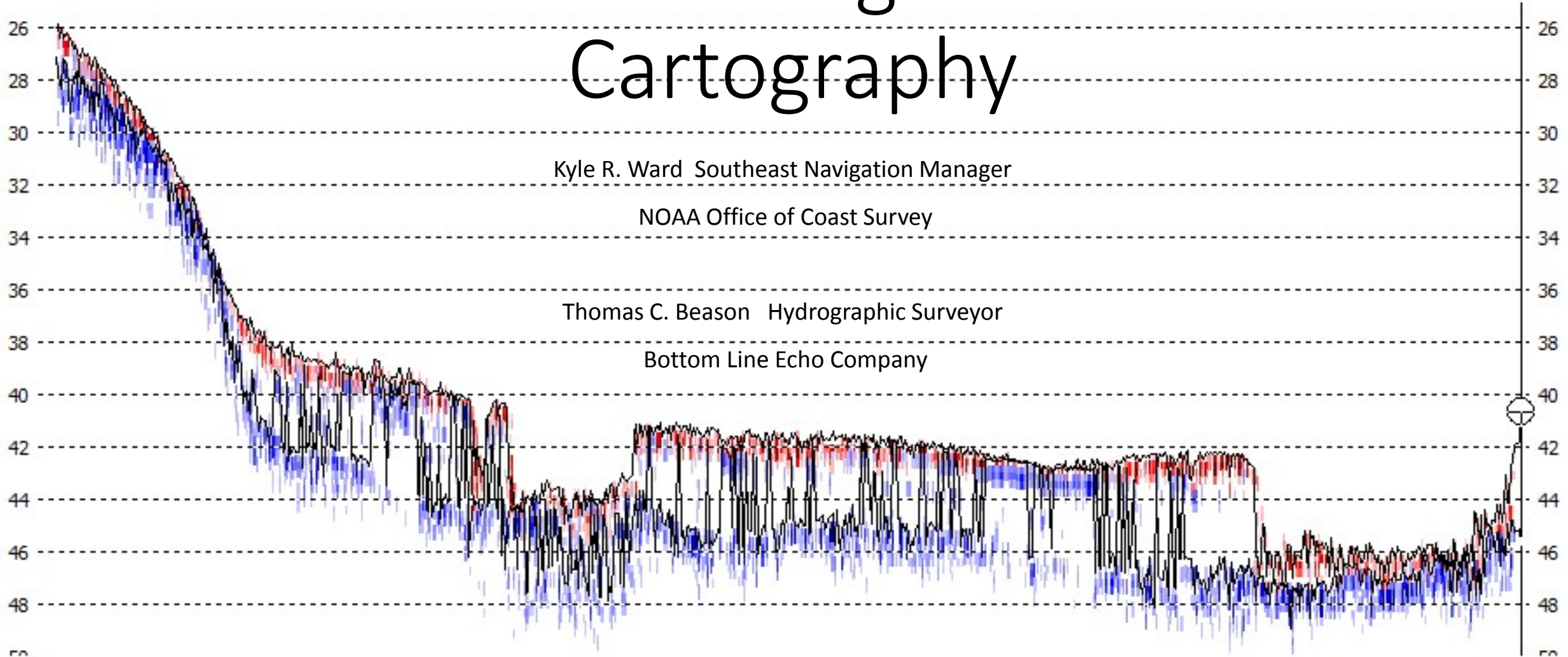
Kyle R. Ward Southeast Navigation Manager

NOAA Office of Coast Survey

Thomas C. Beason Hydrographic Surveyor

Bottom Line Echo Company

Echogram - Depth vs DBL



Depth 1: 46.5

Depth 2: 51.5

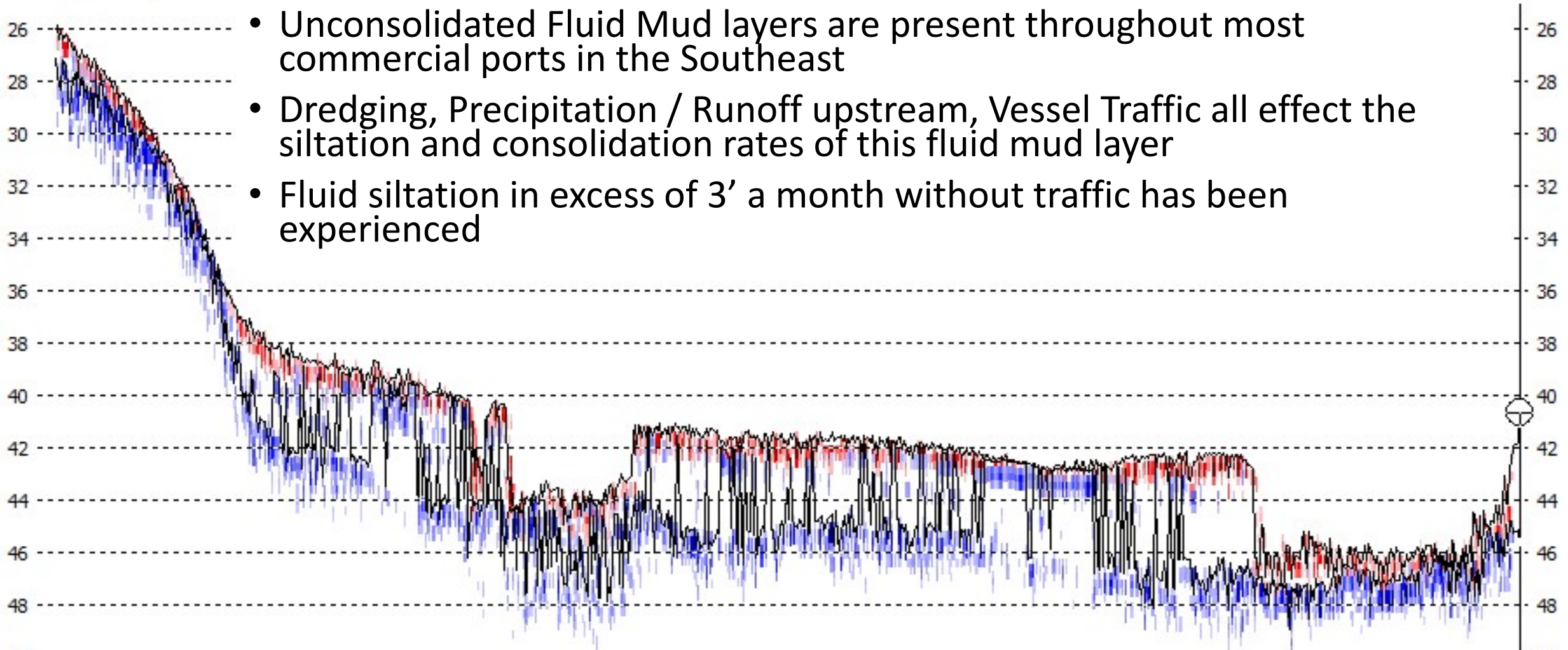
Bottom Line Echo Company

- Established in 1995 – Currently in our 25th Year of Service to the Savannah Maritime Community
- Providing Single Beam, Multi Beam, Side Scan and Magnetometer Surveys across the Eastern United States
- Actively work with local USCG and USACOE with Port of Savannah berth operations on all aspects of marine navigational monitoring and emergency response

Single Beam Importance in Unconsolidated Fluid Mud Navigational Channels

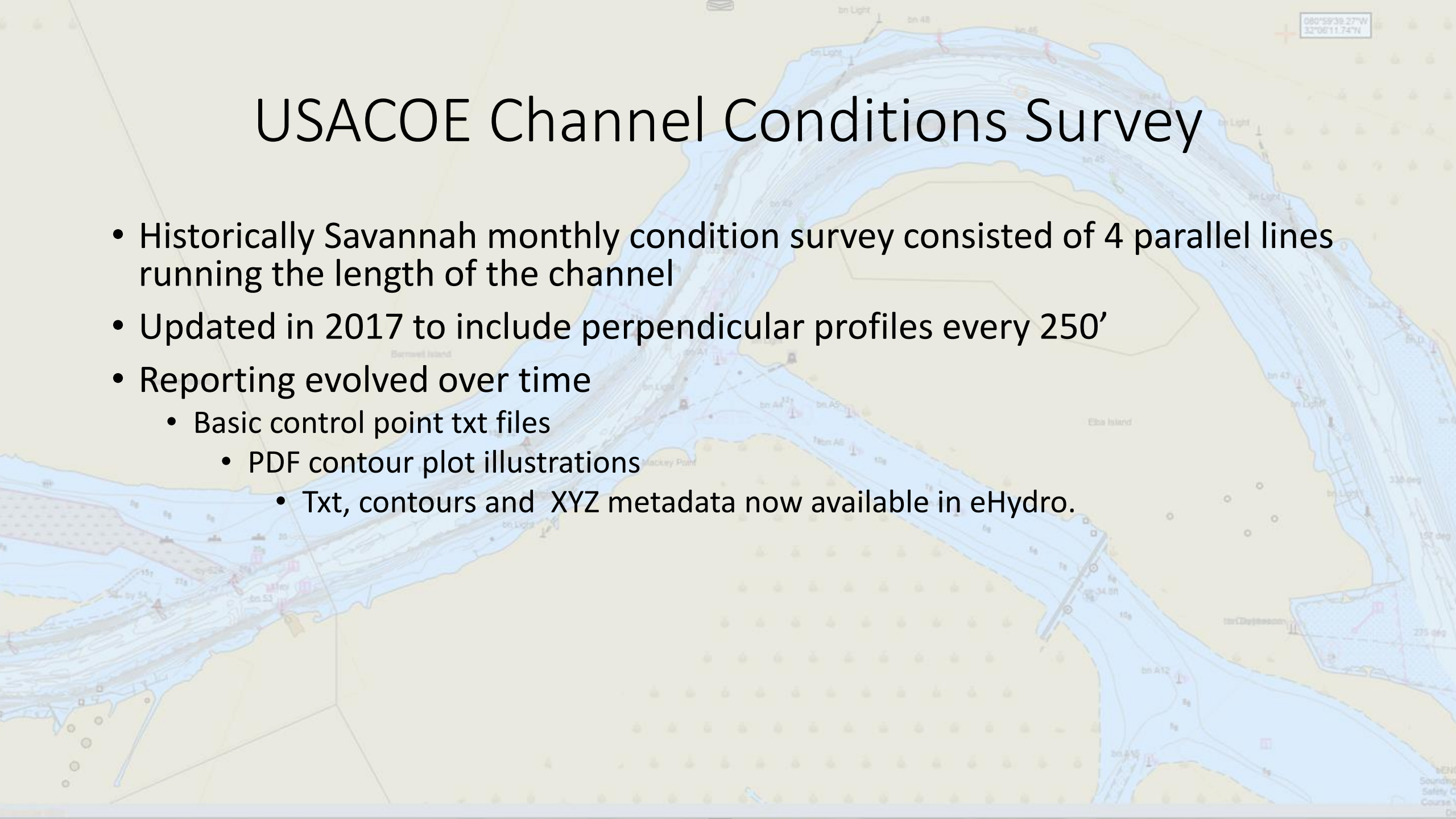
Echogram - Depth vs DBL

- Unconsolidated Fluid Mud layers are present throughout most commercial ports in the Southeast
- Dredging, Precipitation / Runoff upstream, Vessel Traffic all effect the siltation and consolidation rates of this fluid mud layer
- Fluid siltation in excess of 3' a month without traffic has been experienced



USACOE Channel Conditions Survey

- Historically Savannah monthly condition survey consisted of 4 parallel lines running the length of the channel
- Updated in 2017 to include perpendicular profiles every 250'
- Reporting evolved over time
 - Basic control point txt files
 - PDF contour plot illustrations
 - Txt, contours and XYZ metadata now available in eHydro.

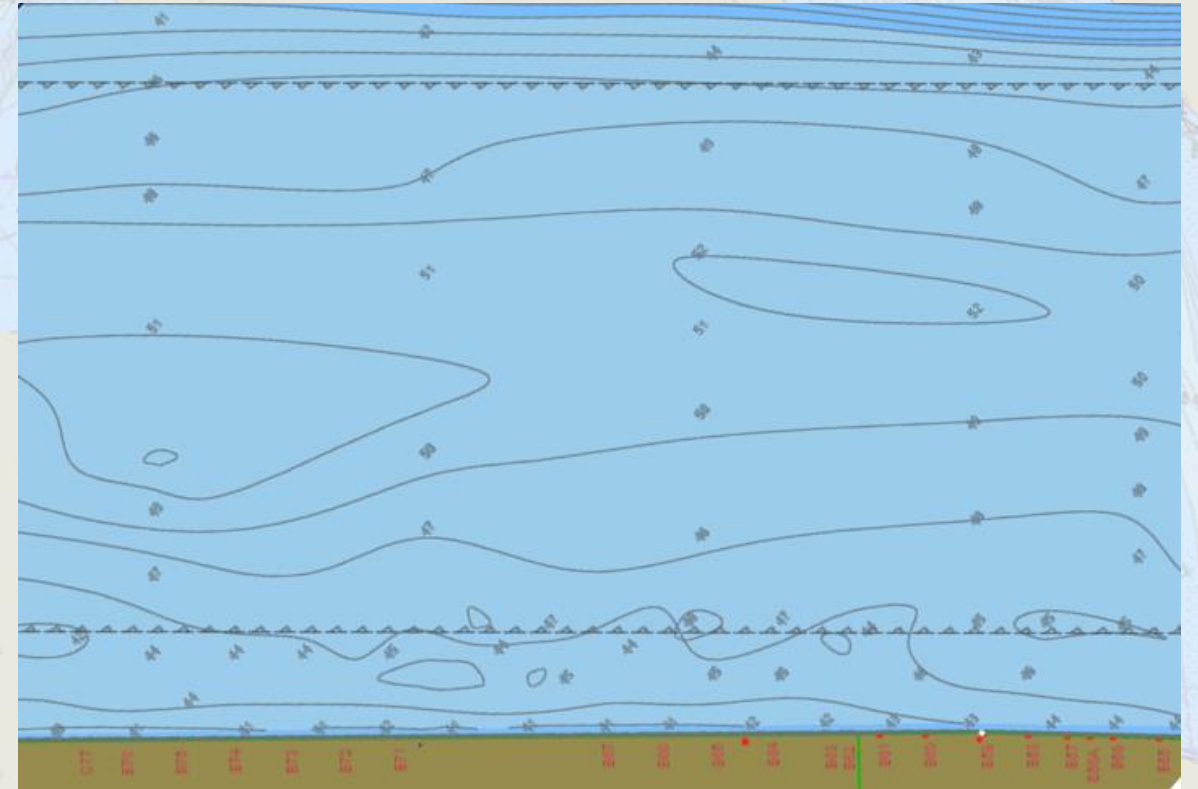


e-Hydro and Precision Navigation

- Savannah River Pilots engaged in utilizing PPU's to assist pilots for planning passing zones and schedules
- Berth and channel condition maps supplied to River Pilots and Ship Assist Tug Boat Companies to comply with Port of Savannah Guidelines - Minimum Under Keel Clearance
- 2017 we began to produce bathymetric ENC charts for use in PPU's

e-Hydro and Precision Navigation

- Components of a complete bENC for Precision Navigation
 - E-Hydro Channel Conditions
 - Berth Conditions Survey
 - Berth DXF files define important mooring components
- Compile monthly utilizing Hypack ENC Editor and all updated data sets
- QA-QC in SEAIq PPU
- Delivered electronically to Savannah River Pilots



e-Hydro and Precision Navigation

- Future Developments
 - 100% adoption by commercial deep-water facilities
 - Integration of multiple wind, tide, current stations utilizing AIS IoT capabilities to further refine the vessel transit time algorithm
 - Potential exists for establishing a daily updated process to allow for yesterdays data to create a real time bENC chart

Outline

- Nautical Charting Plan Ideas for Charting Channel
- eHydro Analysis Tools
- Data examples
 - Deep Draft
 - ICW
- Changeable Inlets
 - Oregon Inlet
 - Carolina Beach Inlet

Quotes from National Charting Plan

- In partnership with the U.S. Army Corps of Engineers, Coast Survey will continue to **explore** ways to improve the **consistent, up-to-date provision of depth information in channels maintained by the Corps**. This will likely **change the way channel depths are portrayed** on charts
- Coast Survey believes that **standardizing the presentation of channel data** will improve data consistency and safety.
- We envision a time when **digital channel bathymetry products from USACE** hydrographic surveys are available in the form of ENC data or a compatible digital data layer that **could be displayed and used directly within a mariner's ECDIS or ECS**. (Third party data?)

bENC Creation from eHydro

- Software
 - Safe Software Feature Manipulation Engine (S57 Writer Plug in from SevenCs)
 - Google Sheets
- Data
 - Existing ENC Cell Boundaries (Could use alternate spatial frame)
 - eHydro Survey Outline Database (contains link to condition surveys)
 - Relies heavily on Bathymetry_Vector file
 - Google Sheet with ENCs containing configureable attribute information
- Uses
 - Situational Awareness
 - Chart Comparison
 - Hurricane Response Planning

FME Workflow eHydro to S-57 in FME

Start

1. Select Recent Surveys
by ENC Cell

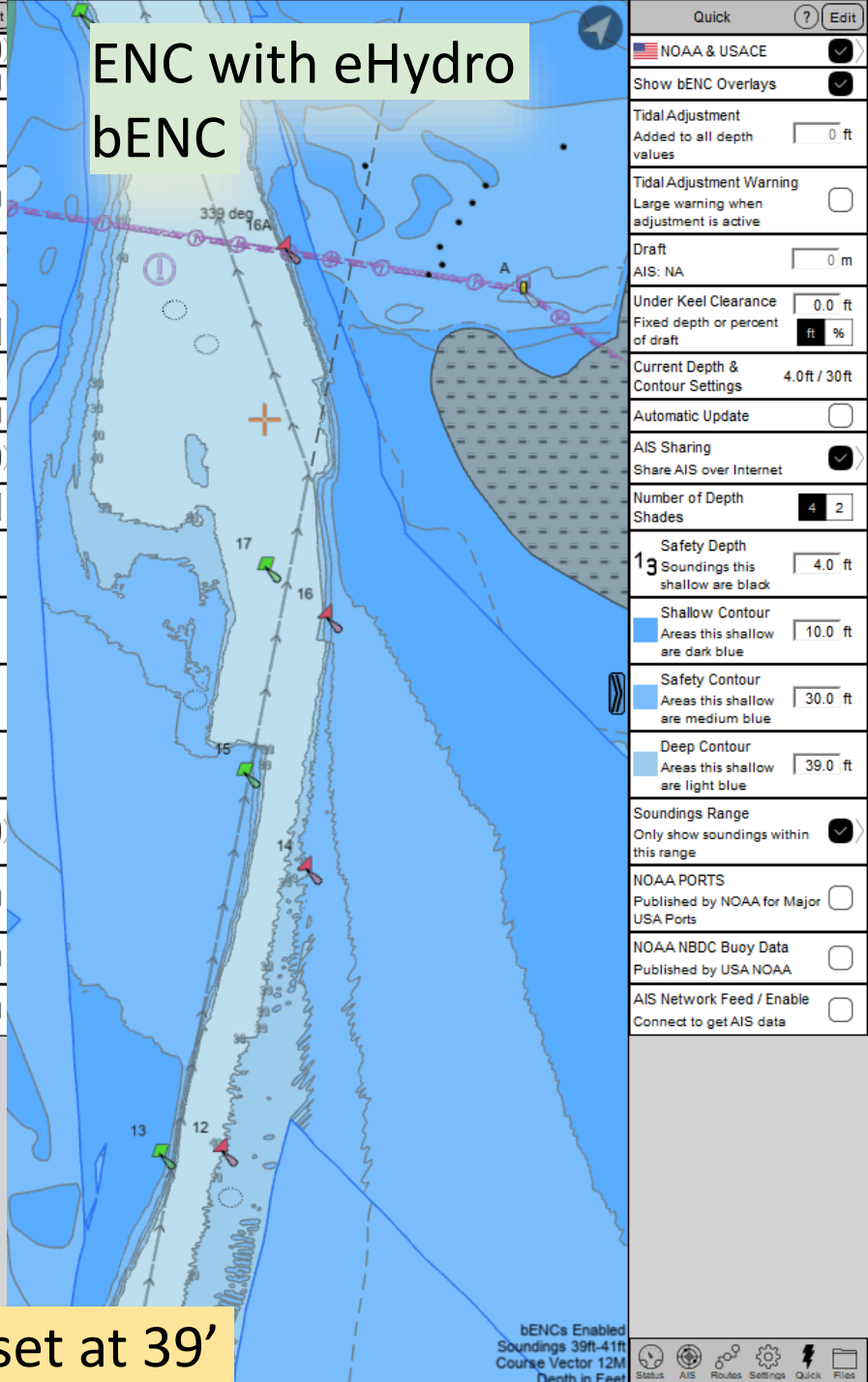
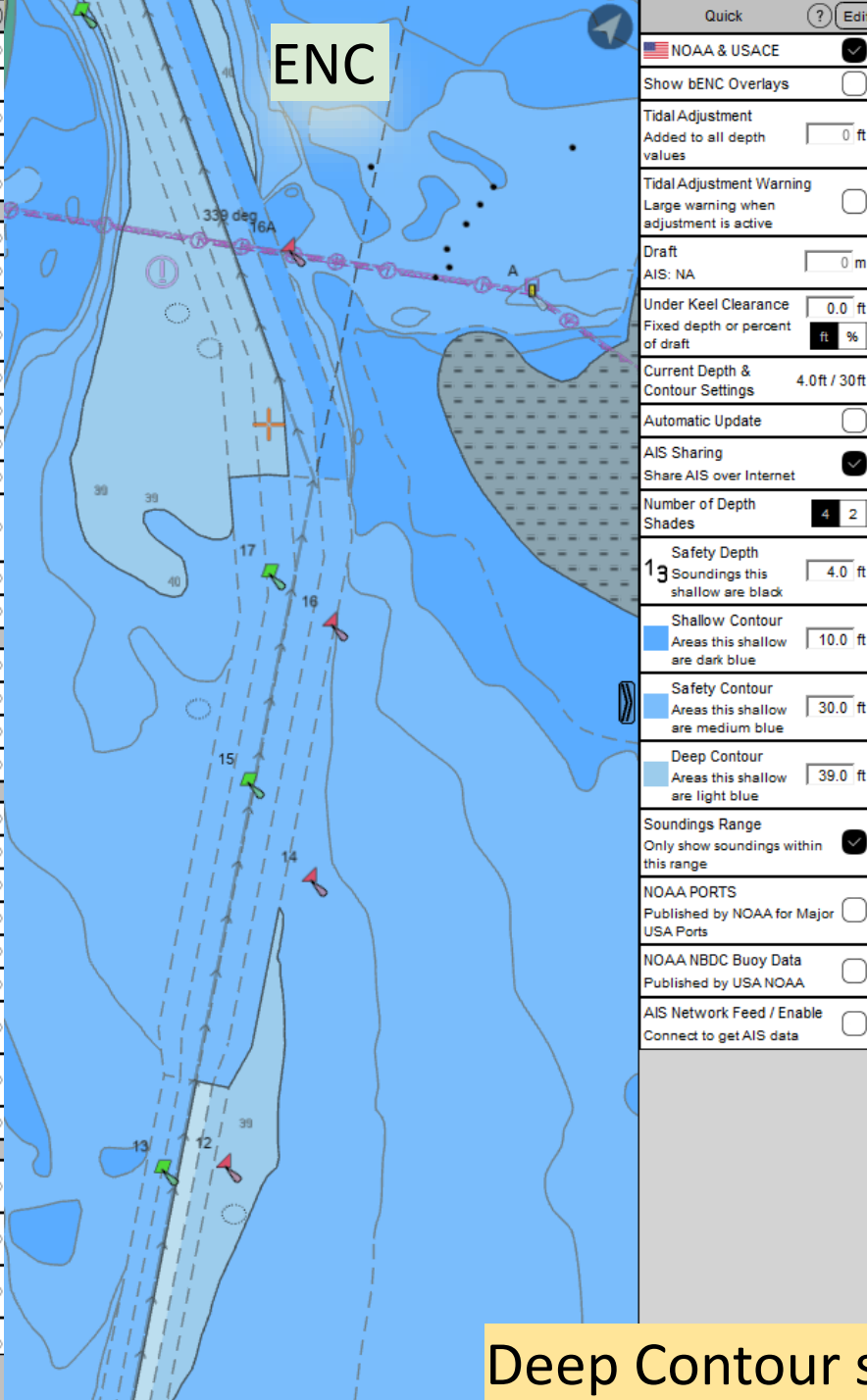
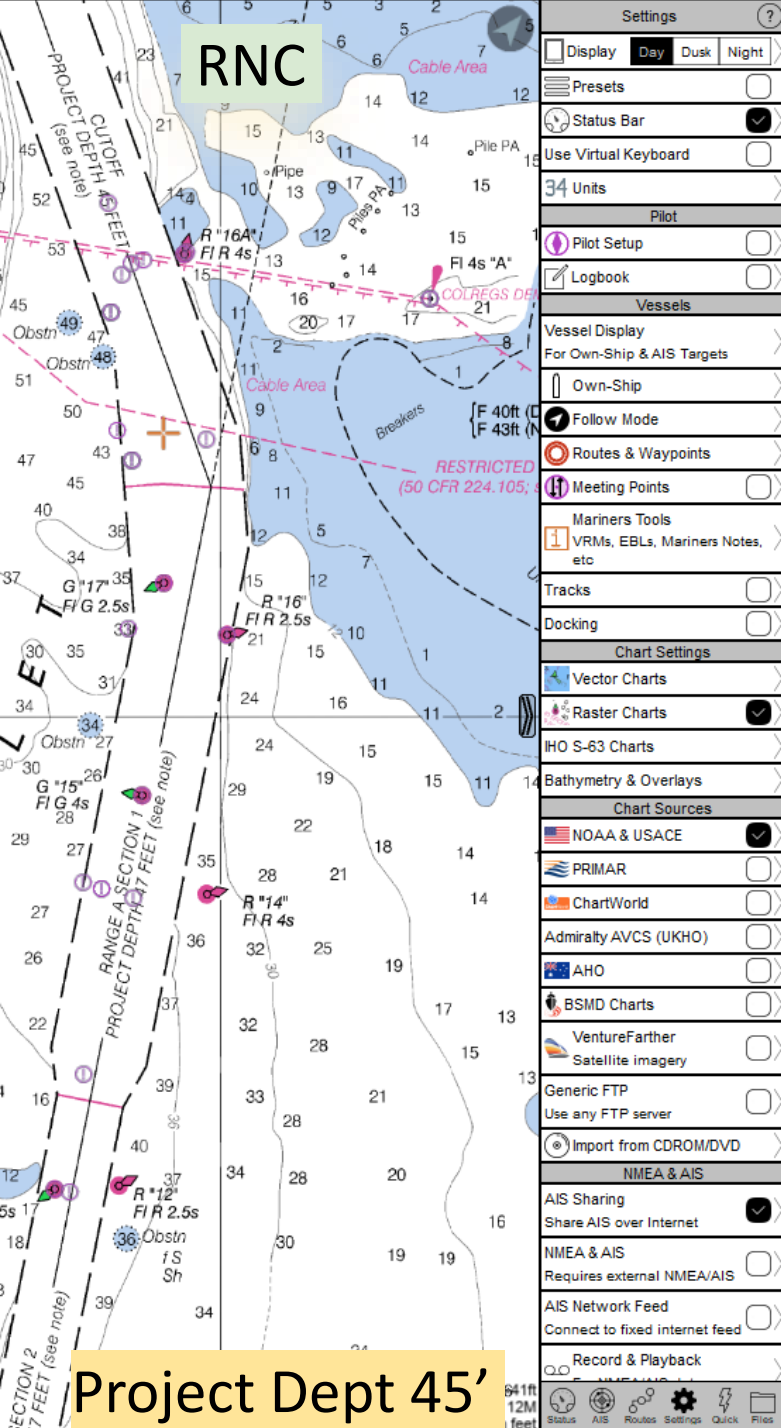
2. Download Survey
From eHydro Clip
overlapping data by
date

Finish

4. Format Attributes for S-57 Format

3b. Auto Select Soundings

3a. Join bathymetry vector regions by
selected intervals and contour creation and
smoothing



Columbia River, Oregon



Columbia River, Oregon



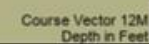
Near Ashepoo Coosaw Cutoff, SC

Near Ashepoo Coosaw Cutoff, SC

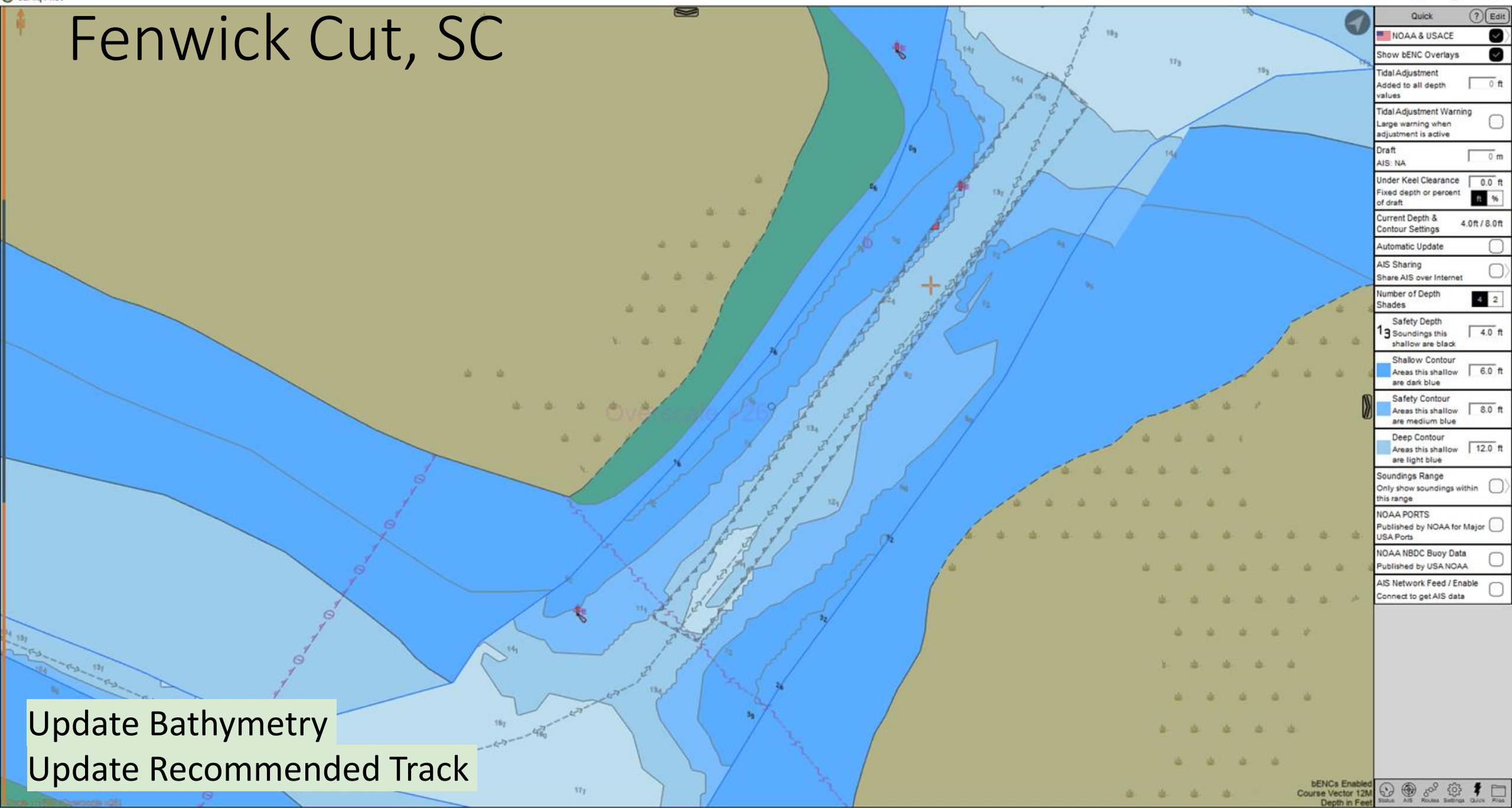
Update Bathymetry
Update Recommended Track

Near Ashepoo Coosaw Cutoff, SC

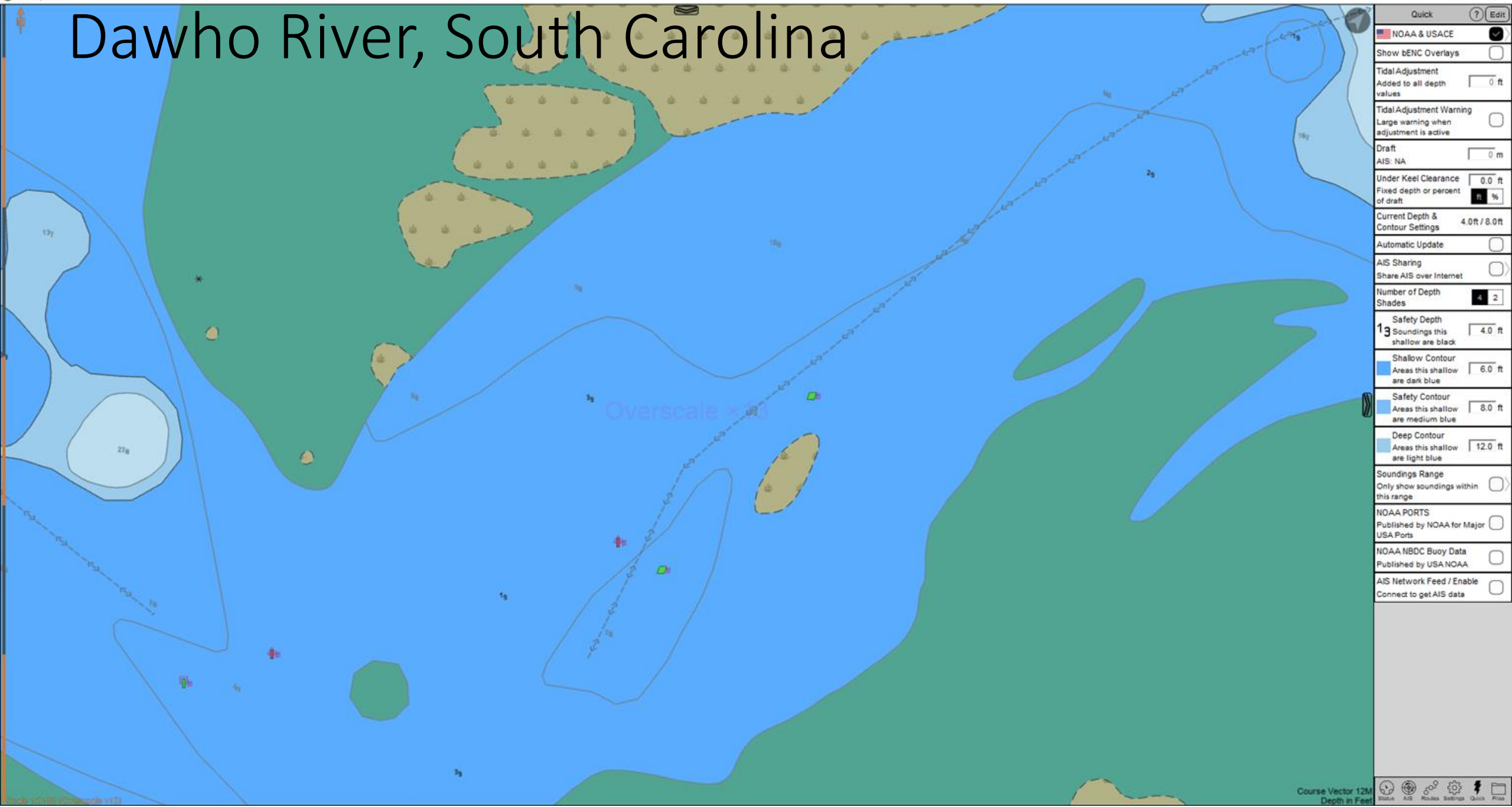
Update Bathymetry
Update Recommended Track



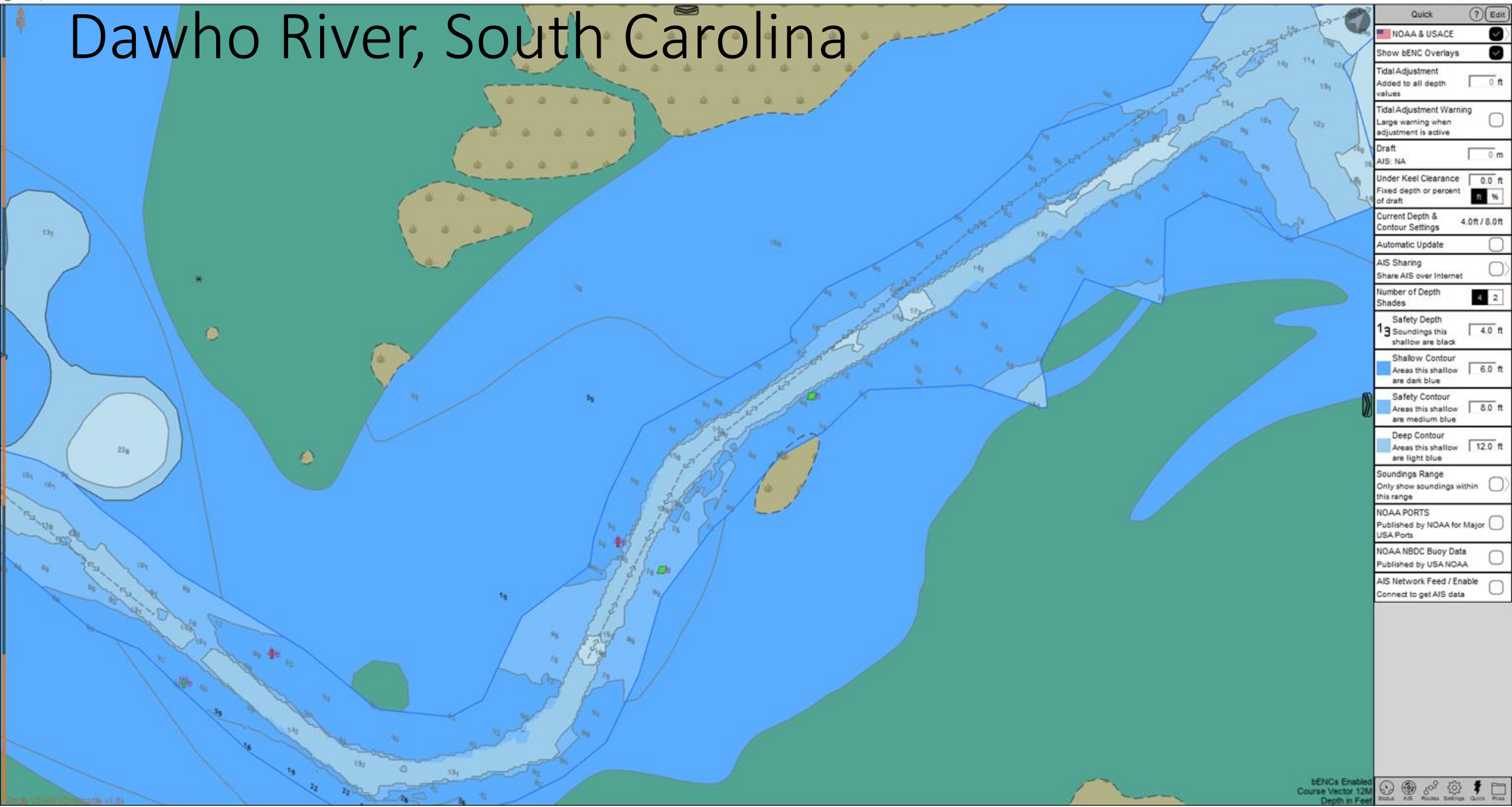
Fenwick Cut, SC



Dawho River, South Carolina



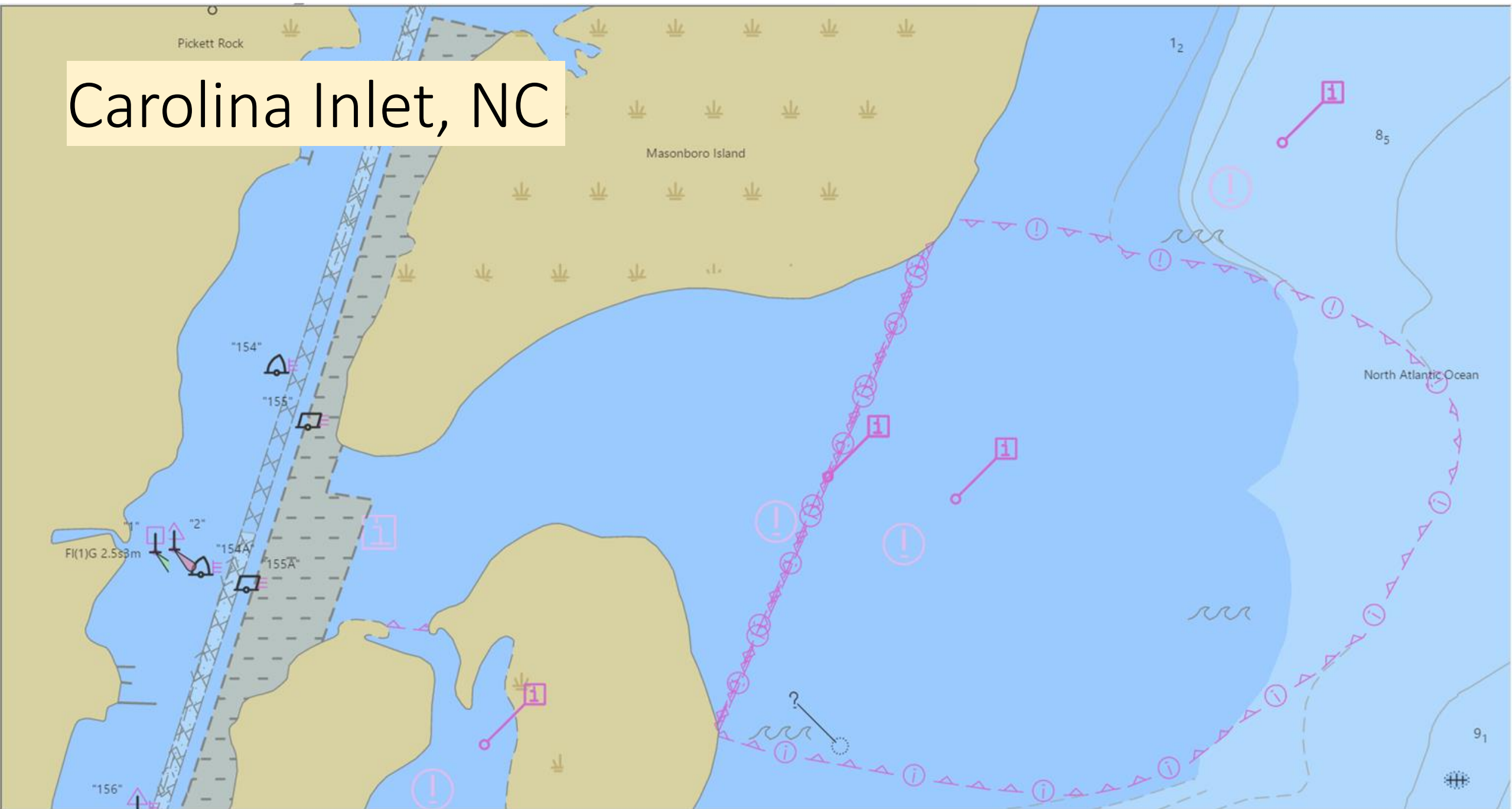
Dawho River, South Carolina



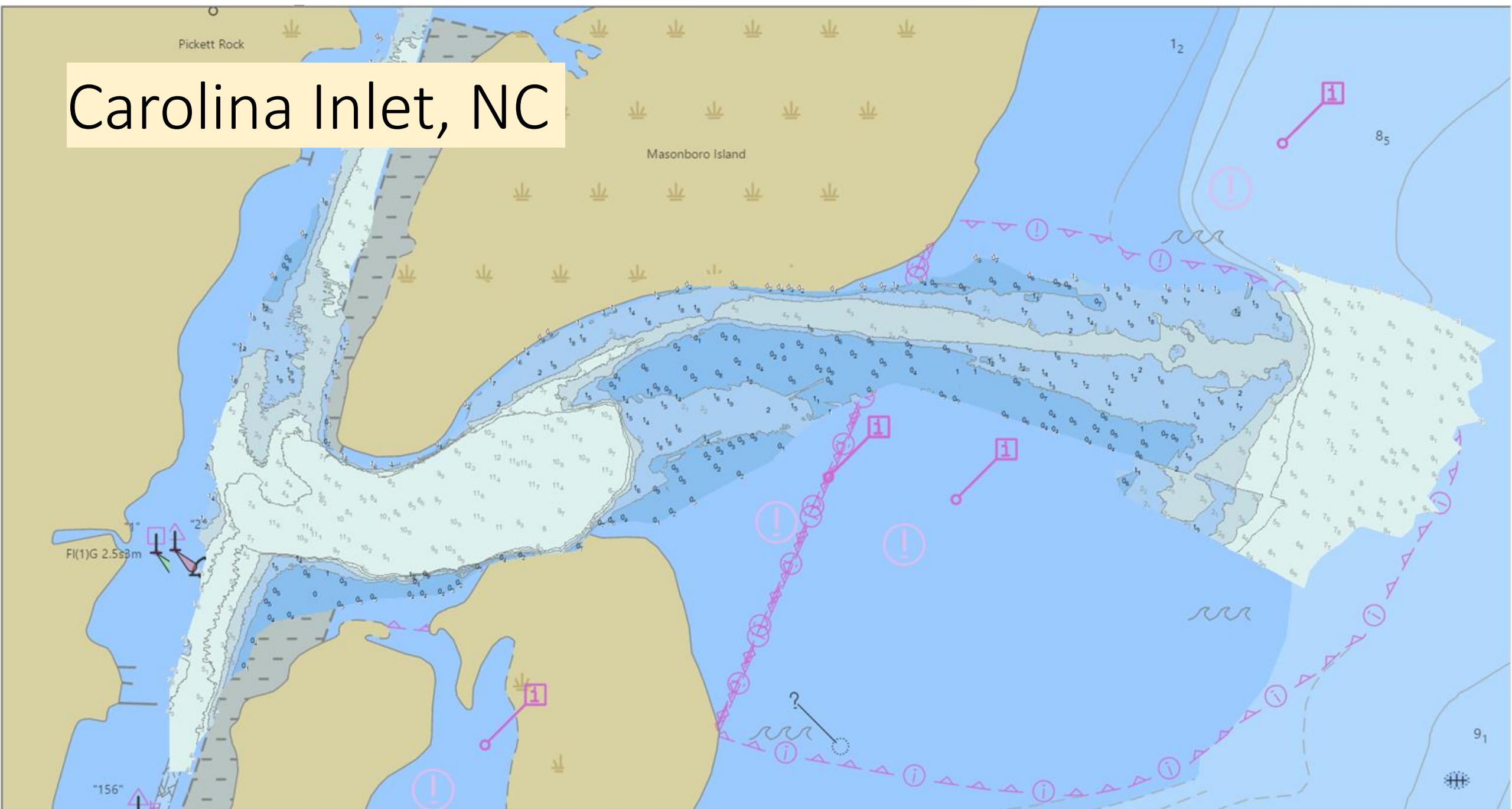
Changeable Inlets

NOAA policy allows hydro and ATONs to not be charted in changeable inlets. These shallow draft inlets are vital to the local economies as harbors of refuge and life saving. USACE and USCG spend significant effort in maintaining these areas and have ask that this policy be reconsidered.

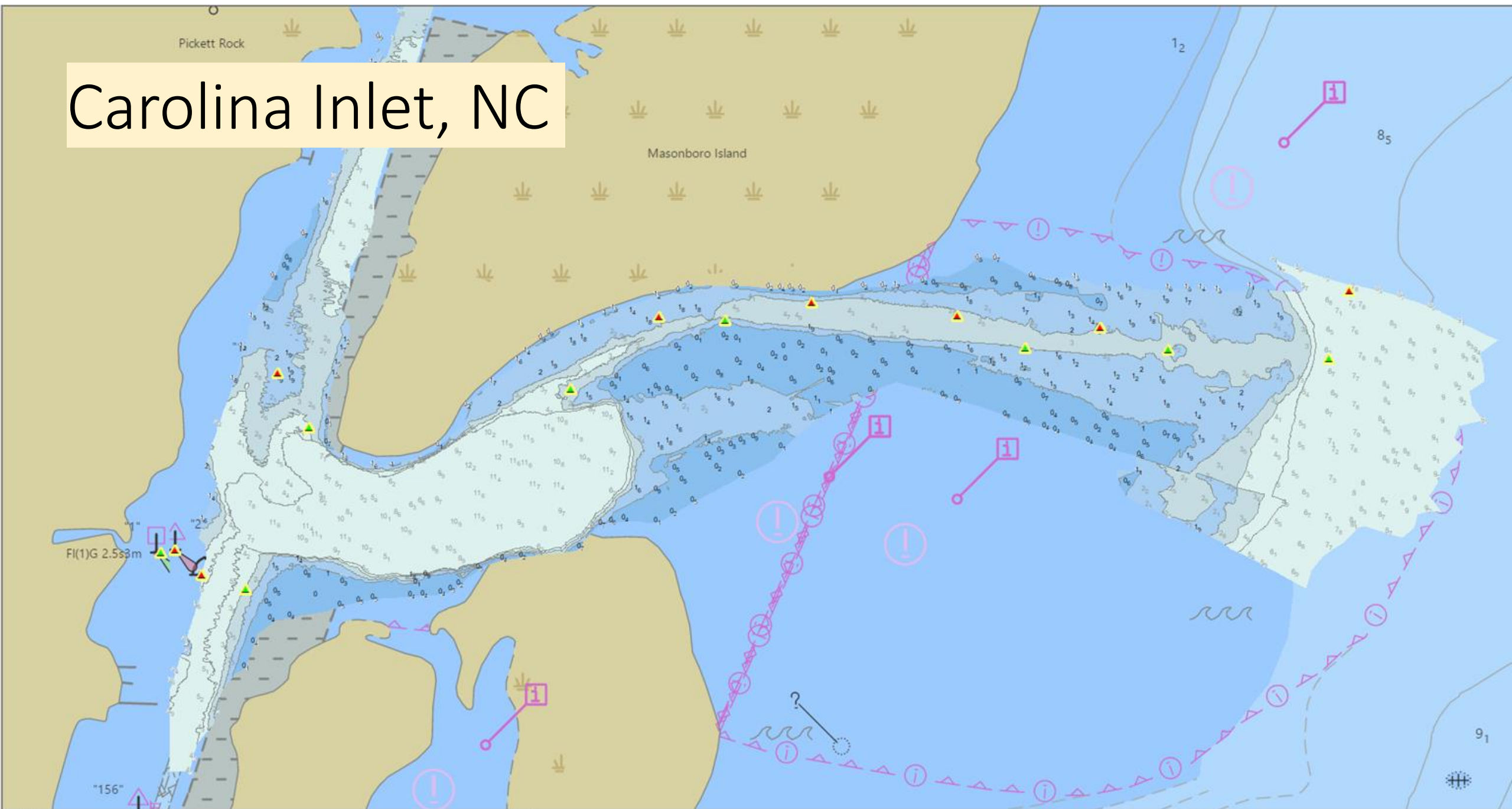
Carolina Inlet, NC



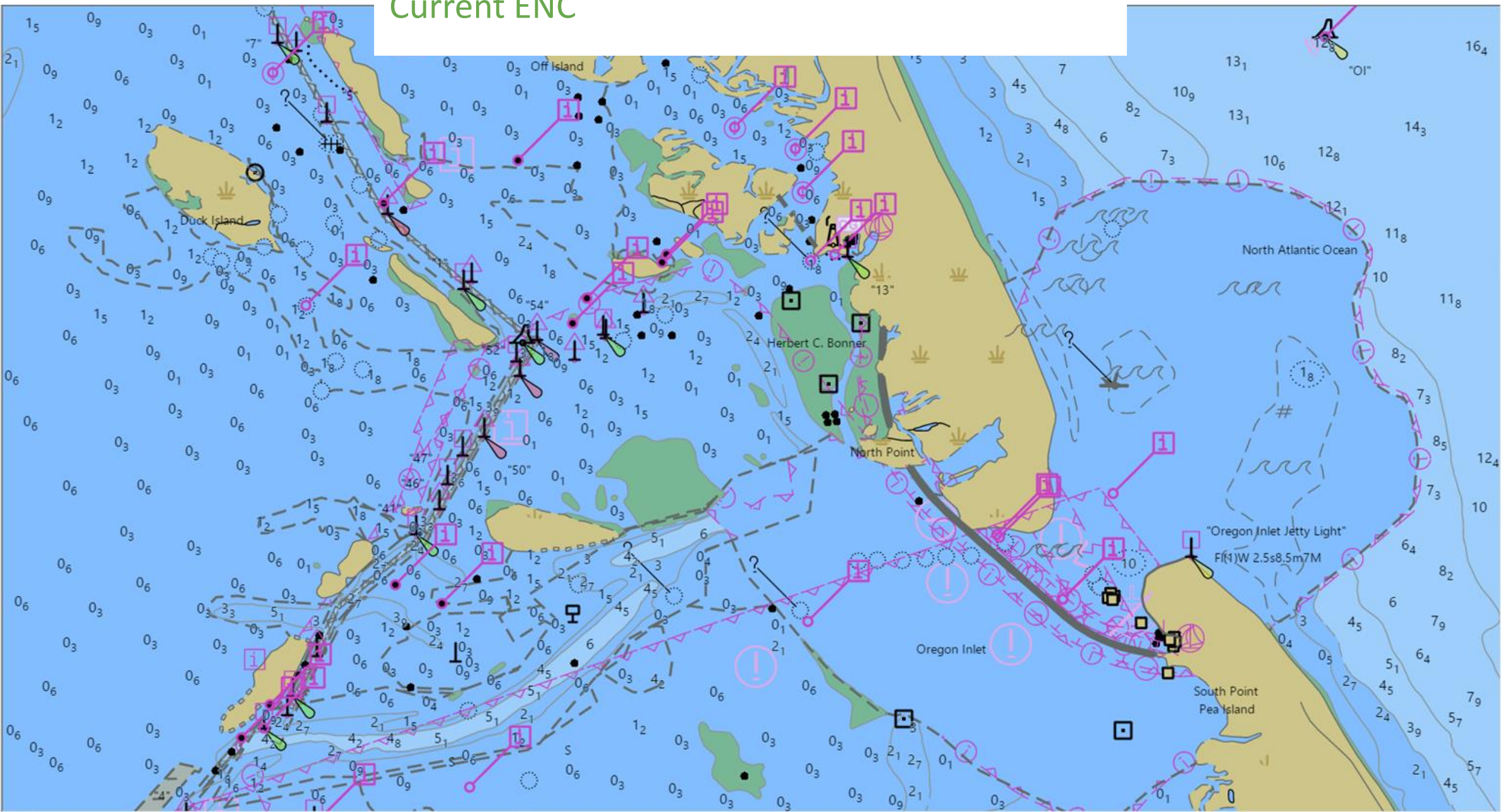
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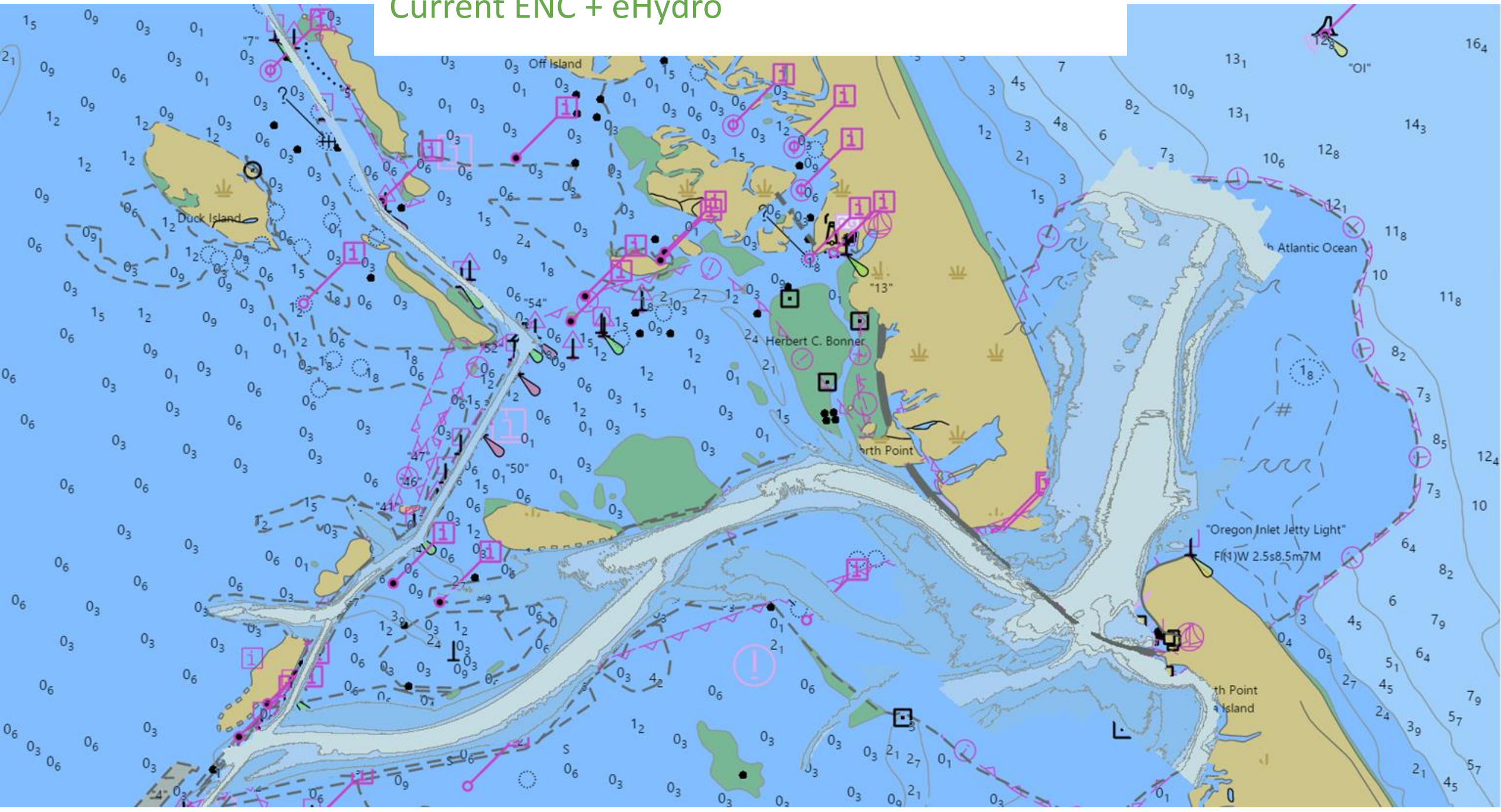
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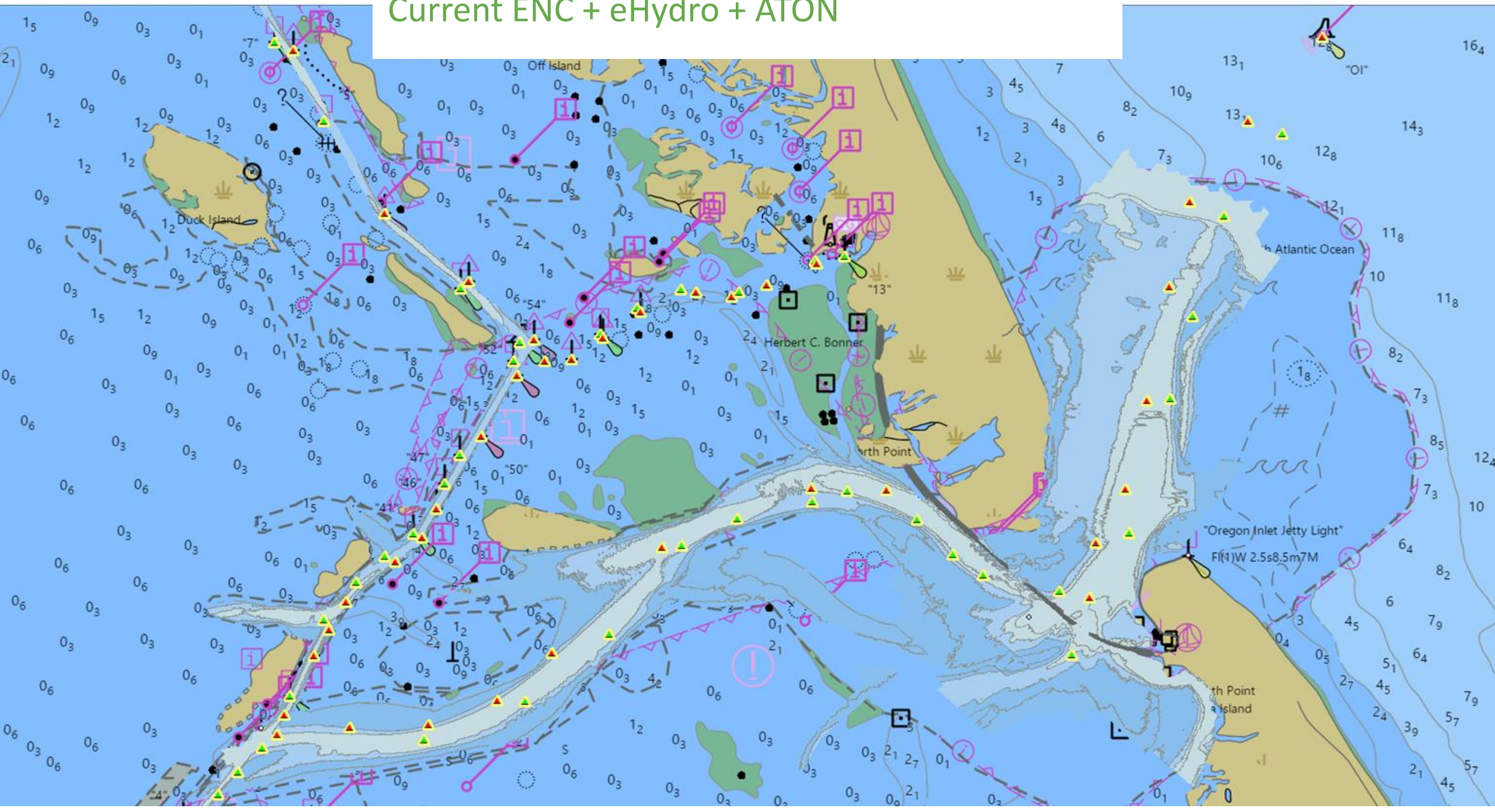
Current ENC



Current ENC + eHydro



Current ENC + eHydro + ATON



Questions?

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